CLAIMS

1. An article for delivering a drug and a nucleic acid, the article comprising:

a nanoparticle having a first portion capable of associating a nucleic acid and a second portion capable of associating a drug.

2. An article as in claim 1 wherein the nanoparticle is capable of associating with and maintaining association with a nucleic acid and a drug under non-physiological conditions, and of disassociating the nucleic acid and drug under physiological conditions.

3. An article as in claim 1 wherein the nanoparticle is capable of passing through a cell membrane.

4. An article as in claim 1 wherein the nucleic acid is DNA

5. An article as in claim 1 wherein the drug is a cancer drug

6. An article as in claim 1 wherein the article forms a micelle

7. An article as in claim 6 wherein a drug is associated with an interior of the micelle and a nucleic acid is associated with an exterior of the micelle.

8. An article as in claim 1 wherein the nanoparticle is stable at a concentration of greater than 5 mg/L.

9. An article as in claim 1 wherein the nanoparticle is capable of crossing the blood/brain barrier.

10. A composition comprising an article of claim 1 and a pharmaceutically acceptable carrier.

11. An article as in claim 1 wherein the nanoparticle comprises a graft co-polymer having a backbone including tertiary amines, at least a portion of the tertiary amines quaternized and bound to a hydrophobic side chain.

12. An article as in claim 11 wherein the hydrophobic side chain comprises cholesterol.

13. An article as in claim 11 wherein the polymeric backbone comprises a copolymer of quaternized and non-quaternized tertiary ammonium groups.

14. An article as in claim 13 wherein the polymeric backbone further comprises an ester linkage.

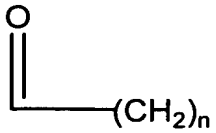
15. An article as in claim 13 wherein the polymeric backbone comprises a polyester.

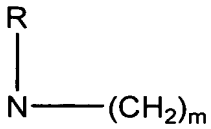
16. An article as in claim 13 wherein the polymeric backbone further comprises a polyether.

17. A composition comprising a chemical having the structure:

$$-(X\text{-}Y\text{-}Z)_q\text{-}(X'\text{-}Y'\text{-}Z')_p-$$

wherein X, Y and Z, are selected, independently, from





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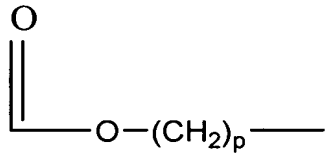
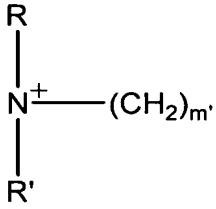
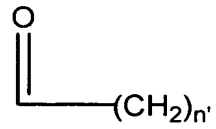


and

at least one of X', Y' and Z' includes R', and X', Y' and Z' are selected, independently, from





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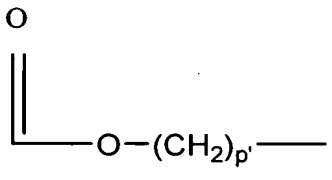

wherein, R is H, an alkyl or a substituted alkyl,
R' is a hydrophobic group; and
n, m, p, n', m' and p' are greater than zero.

18. A polymeric structure comprising the chemical structure of claim 17 wherein the polymeric structure forms a core-shell nanoparticle having an interior and an exterior.

19. A polymeric structure as in claim 18 having a diameter less than 20 μm.

20. The polymeric structure of claim 18 having a diameter of greater than 10 nm and less than 1000 nm.

21. The polymeric structure of claim 18 wherein the polymeric structure exhibits a zeta potential of greater than 40 mV.

22. The polymeric structure of claim 18 wherein the polymeric structure has a critical association constant of less than 100 mg/L.

23. The polymeric structure of claim 18 wherein the polymeric structure has a critical association constant of less than or equal to 9.6 mg/L.

24. A method of delivering a non-nucleic acid drug to a subject comprising:
associating the non-nucleic acid drug with the polymeric structure of claim 18 to form a drug delivery vehicle; and
administering the drug delivery vehicle to the subject.

25. A method of delivering a nucleic acid to a subject comprising:

associating the nucleic acid with the polymeric structure of claim 18 to form a nucleic acid delivery vehicle; and

administering the nucleic acid delivery vehicle to the subject.

26. A method of administering a drug and a nucleic acid to a subject comprising:

providing a drug/nucleic acid complex, the complex including a non-nucleic acid drug associated with a nucleic acid; and

delivering the complex to the subject.

27. A method as in claim 26 wherein the drug and nucleic acid are each associated with a common nanoparticle.

28. A method as in claim 26 wherein the drug and nucleic acid are administered concurrently to a cell.

29. A method as in claim 26 wherein the nucleic acid is DNA or siRNA

30. A method as in claim 27 wherein the nanoparticle comprises a polymer.

31. A method as in claim 30 wherein the nanoparticle forms a micelle

32. A method as in claim 27 wherein the nanoparticle includes a polar region and a hydrophobic region.

33. A method as in claim 27 wherein the nanoparticle exhibits a cytotoxicity of less than polyethyleneimine (PEI) or lipofectamine

34. A method as in claim 27 wherein the nanoparticle exhibits an IC50 of greater than or equal to 160 mg/L.

35. A method as in claim 26 wherein the wherein the complex is delivered orally.

36. A method as in claim 26 wherein the wherein the complex is delivered locally.

37. A method as in claim 26 wherein the wherein the complex is delivered intravenously.

38. A method as in claim 26 wherein the wherein the complex is delivered transdermally.

39. A method as in claim 26 wherein the wherein the complex is delivered parenterally.

40. A method of making a drug delivery composition comprising:

providing a fluid comprising a polymer and a drug;

allowing the polymer to form a micelle having an interior and an exterior, the drug being associated with the interior of the micelle; and

associating a nucleic acid with the exterior of the micelle.

41. A method as in claim 40 wherein the ratio of drug to nucleic acid is pre-determined.

42. A method as in claim 40 further comprising drying the micelle.

43. A method as in claim 42 further comprising forming a powder comprising the micelle.

44. A kit comprising:

a container including an amphoteric polymeric nanoparticle;

a drug associated with a first portion of the nanoparticle;

a nucleic acid associated with a second portion of the nanoparticle; and

instructions for administering the nanoparticle to a subject.

45. A kit comprising:

a container including an amphoteric polymer capable of associating both a nucleic acid and a non-nucleic acid drug ; and

instructions for associating a non-nucleic acid drug and a nucleic acid with the polymer.

46. The kit of claim 45 wherein the polymer includes a hydrophilic backbone and a hydrophobic branch chain.

47. The kit of claim 45 wherein the polymer is pegylated.

48. A composition of matter comprising:

a nanoparticle;

a non-nucleic acid drug associated with a first portion of the nanoparticle; and

a nucleic acid associated with a second portion of the nanoparticle.